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Florissant Exhibit.

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VISIT TO THE FLORISSANT EXHIBIT IN THE BRITISH MUSEUM (NATURAL HISTORY).

SATURDAY, MARCH 6TH, 1909.

Director: Dr. F. A. BATHER, F.R.S.

(*Report by* THE DIRECTOR: *Published by permission of the Trustees of the British Museum.*)

ABOUT thirty members assembled in the Fossil Reptile Gallery, where there had been placed on temporary exhibition a case of fossil animals and plants from the Miocene Lake-basin of Florissant.

Florissant is a small town on the Colorado Midland Railway, sixty miles south-south-west of Denver, and about thirty miles west-north-west of Colorado Springs. It lies some 8,000 ft. above the sea on the floor of a broad valley, the surrounding hills being rounded off and rarely, within a radius of seven miles, rising more than a thousand feet above Florissant itself. But fifteen miles to the east are the summits of the Colorado Range with Pike's Peak (14,083 ft.). The country rock generally is granite. The climate is dry, the vegetation of an arid character, and the streams small.

Formerly the district seems to have been drained by a stream

flowing southwards. Near Florissant this was held up in the form of a narrow irregular lake about fifteen miles long and varying greatly in width. This lake has now entirely disappeared, and, while a small southern tract still drains southwards, a later uplift has directed the drainage of the remainder northwards and westwards into the South Platte River.

The extent of this former Lake Florissant is inferred from the deposits now found on the valley-floor, cut into miniature cañons by the modern creeks. The thickness of these lake-beds is given by the U.S. Geological Survey (1894, *Geol. Atlas*, fol. 7) as 50 ft., but later work suggests that this is an under-estimate. The lower part of the deposit is a non-fossiliferous mudstone with conchoidal fracture. The 20 ft. above this are occupied by a series of laminæ very variable in composition and thickness, but composed mainly of volcanic ashes, mud, and sand. In places these contain abundant fossils, chiefly insects and plants.

Between 1874 and 1880 various expeditions went to Florissant to collect these fossils, which were mainly described by S. H. Scudder and Leo Lesquereux in the Monographs of the U.S. Geological Survey. From these early collections the British Museum possesses a series presented by Mr. R. C. Hills in 1891, and another series collected by an expedition from Princeton University in 1877 and acquired by exchange in 1892. Many of the plants in the latter series were examined and named by Lesquereux himself. Of late years the exploration has been renewed by the University of Colorado, and in an expedition led by Professor T. D. A. Cockerell in 1907 the British Museum, among other institutions, co-operated. It was chiefly by this last expedition that the more interesting specimens now exhibited were obtained, and other treasures are still coming in as the collections are worked out by the numerous experts. The following list of the species at present in the National Collection will give some idea of the life-forms preserved at Florissant, but no conception of their number in either species or individuals. There are already known a fragmentary mammal, two species of bird, eight species of fish, two land molluscs, and four or five from fresh water. About a thousand species of arthropods have been described, mostly insects, and there are more to follow. There are about 200 species of plants representing over a hundred genera.

The age of the Florissant shales has long been uncertain, but a reconsideration of the old evidence with that recently obtained leads Professor Cockerell to regard them as Miocene.

The flora indicates a mild, warm, damp climate, similar to that of the uplands of the Southern United States. Most of the plants found were doubtless inhabitants of the lake shore, but streams have at places brought down remains from the drier regions of the surrounding hills.

As may be read in detail on the labels in the case, many of the specimens raise very interesting questions of geographical distribution. As instances may be mentioned the tsetse-fly (Glossina) now found only in Africa and the south-east of Arabia, and *Lomatites*, which is found fossil in both Europe and North America, though *Lomatia*, to which it appears closely allied, now occurs only in Australia, Tasmania, and Chile. But those who wish to study these questions must refer to the papers quoted at the end of this report.

A selection from the Museum collection is at present exhibited in a small table-case, with the animals on one side and the plants on the other. They are arranged in systematic order as follows:*

PISCES.

Aphredoderidæ
Trichophanes foliarum Cope R (34) . . . . . P. 10631

MOLLUSCA.

Limnæidæ
Limnæa Scudderi Cockerell . . . . . G. 19525
Planorbis florissantensis Cockerell . . . . . G. 19524
Cyrenidæ
Sphærium florissantense Cockerell . . . . . L. 21193

INSECTA

NEUROPTERA.

Locustidæ
Palæorehnia maculata Cockerell T (26) . . . . . I. 8430
Aeschnidæ
Aeschna solida Scudder . . . . . I. 8419
Agrionidæ
Phenacolestes mirandus Cockerell P (23) . . . . . I. 8423
Calopterygidæ
Trichocnemis aliena Scudder . . . . . I. 8420
Nemopteridæ
Halter americana Cockerell T (16, 30) . . . . . I. 8428
Raphidiidæ
Inocellia tumulata Scudder . . . . . I. 8416
Chrysopidæ
Lithochrysa vetuscula (Scudder) . . . . . I. 8417
Osmylidæ
Osmylus requietus Scudder . . . . . I. 8418

HYMENOPTERA.

Ichneumonidæ
Pimpla appendigera Brues M (1) . . . . . I. 7380
Tenthredinidæ
Phenacoperga coloradensis Cockerell T (16, 22) . . I. 8436
Chalcididæ
Chalcis prævolans Cockerell T (14) . . . . . I. 8422

* In this list the name is in some cases followed by letters in heavy type with these meanings: T = type-specimen or holotype; S = syntype or cotype; P = paratype; M = metatype; F = figured; R = referred to. The number within ( ) following each such letter refers to the paper so numbered in the list of papers at the end. The number that completes each entry (*e.g.*, P. 10631; I. 7380) is the Museum register number.

ORTHOPTERA.

Pompilidæ
Agenia saxigena Cockerell T (20, pt. ii) . . . . . I. 8431
Vespidæ
Palæovespa Gillettei Cockerell M (6) . . . . . I. 7391
Apidæ
Podalirius Melfordi (Cockerell) T (37, 34) . . . . I. 9259
Tortricidæ
Tortrix (?) *florissantana* Cockerell T (19) . . . . I. 8429

HEMIPTERA (HETEROPTERA).

Pentatomidæ
Teleoschistus rigoratus Scudder . . . . . I. 8411
Hydrometridæ
Metrobates æternalis Scudder . . . . . I. 8413
Belostomatidæ
Zaitha volcanica Cockerell T (20, pt. ii.) . . . . I. 8415
Corixidæ
Corixa florissantella Cockerell S (4) . . . . . I. 8424-5

HEMIPTERA (HOMOPTERA).

Cicadidæ
Lithocicada perita Cockerell T (7) . . . . . I. 8414
Cercopidæ
Palaphrodes irregularis Scudder . . . . . I. 8433
Palecphora prævalens Scudder . . . . . I. 8434
Palecphora communis Scudder . . . . . I. 8435
Aphididæ
Aphidopsis lutaria Scudder . . . . . I. 8412
Anconatus Gillettei Cockerell T (33) . . . . I. 9258

DIPTERA.

Cecidomyiidæ
Cecidomyia (?) *pontaniiformis* Cockerell . . . . I. 8432
Tipulidæ
Tipula Limi Scudder . . . . . I. 7364
Tipula Maclurei Scudder F (23) . . . . . I. 8426
Nemestrinidæ
Hirmoneura occultator Cockerell T (32) . . . . I. 9260
Glossinidæ
Glossina oligocena (Scudder) F (13, 23, 30) . . . I. 8421

ARACHNIDA.

Phalangiidæ
Leptobunus atavus Cockerell T (14) . . . . . I. 8427

PLANTAE.*

Polypodiaceæ.
Dryopteris scansa Cockerell T (24) . . . . . V. 2574
Psilotaceæ.
Tmesipteris (?) *Alleni* (Lesquereux) Hollick . V. 2782, V. 11256
Pinaceæ.
Sequoia Haydeni (Lesquereux) Cockerell . . V. 11258, V. 11268
V. 11025
Heyderia coloradensis Cockerell T (24, 30) . . . V. 11266
Juniperaceæ.
Sabina linguæfolia (Lesquereux) Cockerell . V. 2779, V. 11024

* For convenience of reference, the family names here used are taken from Cockerell (24).

Typhaceæ.
Typha Lesquereuxi Cockerell . . . . . V. 2789
Poaceæ.
Stipa laminarum Cockerell S (24) . . . . . V. 11238
Myricaceæ.
Myrica drymeja (Lesquereux) Knowlton . . V. 11231, V. 2588
Myrica Scotti, Lesquereux . . . . . V. 2583
Comptonia obscura (Lesquereux) Cockerell . . . V. 11232
Salicaceæ.
Populus Lesquereuxi Cockerell . . . . . V. 11226
Populus crassa (Lesquereux) Cockerell . . . . V. 11224
Betulaceæ.
Carpinus fraterna Lesquereux . . . . . V. 11255
Fagaceæ.
Fagus longifolia (Lesquereux) Hollick & Cockerell
(= *Fagopsis* Hollick) V. 2787a, V. 11288, V. 11217, V. 11214
Castanea dolichophylla Cockerell M (24, 30) . . . V. 11252
Ulmaceæ.
Ulmus Brownelli Lesquereux . . . . . V. 2585
Planera (?) *myricæfolia* (Lesquereux) Cockerell . . V. 11229
Proteaceæ.
Lomatites acutiloba (Lesquereux) Cockerell . . . V. 11209
Lomatites terminalis (Lesquereux) Cockerell . . . V. 11210
Lomatites tripartita (Lesquereux) Cockerell . . . V. 11208
Aristolochiaceæ
Aristolochia mortua Cockerell M, M (24) . V. 11246, V. 11245
Saxifragaceæ.
Saxifraga (?) *peritula* Cockerell M (24) . . . . V. 11263
Cunoniaceæ.
Weinmannia phenacophylla Cockerell . . . . V. 11239
Weinmannia Haydeni Lesquereux R (24) . . . V. 2785
Weinmannia Lesquereuxi Cockerell P (24) . . . V. 2784
Weinmannia obtusifolia Lesquereux . . . . . V. 11240
Rosaceæ.
Rosa Wilmattæ Cockerell . . . . . V. 11262
Mimosaceæ [Leguminosæ].
Leucaena coloradensis Cockerell . . . . . V. 11432
Viborquia nigrostipellata Cockerell T (24) . . . V. 2579
Cercis parvifolia Lesquereux . . . . . V. 11247
Rutaceæ.
Fagara (?) *delicatula* Cockerell M (24) . . . . V. 11253
Anacardiaceæ.
Rhus Hilliæ Lesquereux . . . . . V. 11043
Rhus (*Cotinus*) *fraterna* Lesquereux . . . . V. 2582
Aquifoliaceæ.
Ilex knightiæfolia Lesquereux . . . . . V. 11265
Ilex Leonis Cockerell R (24) . . . . . V. 2584
Celastraceæ.
Pachistima integra Cockerell T (24) . . . . V. 11267
Staphyleaceæ.
Staphylea acuminata Lesquereux . . . . . V. 11042
Aceraceæ.
Acer Florissanti Kirchner . . . . . V. 11218
Sapindaceæ.
Sapindus stellariæfolius Lesquereux F (30) V. 11399;
R (24) V. 2780; V. 11244
Sapindus coloradensis Cockerell M (24) . . . . V. 11243
Sapindus Leonis Cockerell T (24) . . . . . V. 2569
Tiliaceæ.
Tilia populifolia, Lesquereux . . . . . V. 1126

Araliaceæ.
"*Aralia*" *dissecta*, Lesquereux . . . . . V. 11236
"*Hedera*" *marginata*, Lesquereux . . . . . V. 11242
Ebenaceæ.
Diospyros princetonia Cockerell T (24) . . . . V. 2783
Oleaceæ.
Osmanthus præmissa (Lesquereux) Cockerell . . . V. 2571
Convolvulaceæ.
Porana tenuis Lesquereux . . . . . V. 11241
Cucurbitaceæ.
Sicyos (?) *florissantia* Cockerell T (24) . . . . V. 11261
Compositæ.
Carduus florissantensis Cockerell M, M (3) . V. 11248, V. 11249

LIST OF PAPERS RELATING TO THE FLORISSANT FOSSILS, PUBLISHED AFTER 1905.*

1. BRUES, C. T., 1906.—"Fossil Parasitic and Phytophagous Hymenoptera from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxii, 491-498; Dec. 17th.
2. COCKERELL, T. D. A., 1906.—"A New Fossil Ant." *Entom. News*, xvii, 27-28.
3. ———.—"Fossil Plants from Florissant, Colorado." *Bull. Torrey Bot. Club*, xxxiii, 307-312.
4. ———.—"A Fossil Water Bug." *Canad. Entom.*, xxxviii, 209; June.
5. ———.—"The Fossil Fauna and Flora of the Florissant (Colorado) Shales." *Univ. Colorado Studies*, iii, 157-176; June.
6. ———.—"Fossil Hymenoptera from Florissant, Colorado." *Bull. Mus. Comp. Zool. Harvard*, l, 31-58; June.
7. ———.—"A Fossil Cicada from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxii, 457-458; Dec 17th.
8. ———.—"The Fossil Mollusca of Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxii, 459-462; Dec. 17th.
9. ———.—"Fossil Saw-Flies from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxii, 499-501; Dec. 17th.
10. ———, 1907.—"A Fossil Caterpillar." *Canad. Entom.*, xxxix, 187-188.
11. ———.—"An Enumeration of the Localities in the Florissant Basin, from which Fossils were obtained in 1906." *Bull. Amer. Mus. Nat. Hist.*, xxiii, 127-132; Feb. 25th.
12. ———.—"Fossil Dragon-flies from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxiii, 133-139; Feb. 25th.
13. ———.—"A Fossil Tsetse-Fly in Colorado," *Nature*, lxxvi, 414; Aug. 22nd.
14. ———.—"Some Fossil Arthropods from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxiii, 605-616; Aug. 26th.
15. ———.—"Some Coleoptera and Arachnida from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxiii, 617-621; Aug. 26th.
16. ———.—"Some Old-world Types of Insects in the Miocene of Colorado." *Science* (n.s.), xxvi, 446-447; Oct. 4th.
17. ———.—"A Fossil Butterfly of the Genus Chlorippe." *Canad. Entom.*, xxxix, 361-363, pl. x; Nov.

* A bibliography down to June, 1906, is given by Henderson (41). The present list, though probably not quite complete, shows the main results of the recent explorations, and contains all the papers that refer to specimens in the British Museum.

18. COCKERELL, T. D. A., 1907.—"A Miocene Wasp." *Nature*, lxxvii, 80; Nov. 28th.
19. ———.—"A Fossil Tortricid Moth." *Canad. Entom.*, xxxix, 416; Dec.
20. ———, 1908.—"Descriptions of Tertiary Insects," Parts I—IV. *Amer. J. Sci.* (4), xxv, 51-52, 227-232, 309-312; xxvi, 69-75; Jan., March, April, July.
21. ———.—"A Fossil Leaf-cutting Bee." *Canad. Entom.*, xl, 31-31; Jan.
22. ———.—"The fossil sawfly *Perga coloradensis*." *Science*, xxvii, 113-114; Jan. 17th.
23. ———.—"Fossil Insects from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxiv, 59-69, pl. v, ff. 1-13; Feb.
24. ———.—"The Fossil Flora of Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxiv, 71-110; Feb. 7th
25. ———.—"Fossil Chrysopidæ." *Canad. Entom.*, xl, 90-91; Mar.
26. ———.—"A Fossil Orthopterous Insect with the Media and Cubitus Fusing." *Entom. News*, 1908, 126-128; Mar.
27. ———.—"Fossil Cercopidæ (Homoptera)." *Bull. Wisconsin Nat. Hist. Soc.*, vi, 35-38; April.
28. ———.—"Two Fossil Diptera." *Canad. Entom.*, xl, 173-175, pl. iv.; June.
29. ———.—"Descriptions of Tertiary Plants." *Amer. J. Sci.* (4), xxvi, 65-68; July.
30. ———.—"Florissant; a Miocene Pompeii." *Pop. Sci. Mon.*, lxxiv, 112-126; Aug.
31. ———.—"The Dipterous Family Nemestrinidæ." *Trans. Amer. Entom. Soc.*, xxxiv, 247-253, pl. xvi.; Aug.
32. ———.—"Another Fossil Nemestrinid Fly." *Trans. Amer. Entom. Soc.*, xxxiv, 254; Aug.
33. ———.—"Fossil Aphididæ from Florissant, Colorado." *Nature*, lxxviii, 318-319; Aug. 6th
34. ———.—"Some Results of the Florissant Expedition of 1908." *Amer. Natural.*, xlii, 569-581; Sept. [*i.e.* Oct.]
35. ———.—"Fossil Osmylidæ (Neuroptera) in America." *Canad. Entom.*, xl., 341-342, pl. ix.; Oct.
36. ———.—"The First American Fossil *Mantis*." *Canad. Entom.*, xl, 343-344, pl. ix.; Oct.
37. ———.—"Descriptions and records of Bees.—XX." *Ann. Mag. Nat. Hist.* (8), ii, 323-334; Oct.
38. ———, 1909.—"Fossil Diptera from Florissant, Colorado." *Bull Amer. Mus. Nat. Hist.*, xxvi, 9-12, pl i; Jan.
39. ———.—"Fossil Insects from Florissant, Colorado." *Bull. Amer. Mus. Nat. Hist.*, xxvi, 67-76, pl. xvi, ff. 1-5; March 9th.
40. ———.—"Two Fossil Bees." *Entom. News*, 1909, 159-161; April.
41. HENDERSON, JUNIUS, 1906.—"The Tertiary Lake Basin of Florissant, Colorado." *Univ. Colorado Studies*, iii, 145-156, i. pl.; June.
42. HOLLICK, A., 1909.—"A New Genus of Fossil Fagaceæ from Colorado." *Torreya*, ix, 1-3; Jan.
43. ROHWER, S. A., 1908.—"A Fossil Larrid Wasp." *Bull. Amer. Mus. Nat. Hist.*, xxiv, 519-520; June.
44. ———.—"On the Tenthredinoidea of the Florissant Shales." *Bull. Amer. Mus. Nat. Hist.*, xxiv, 521-530; June.
45. WHEELER, W. M., 1906.—"The Expedition to Colorado for Fossil Insects." *Amer. Mus. J.*, vi, 199-203; Oct.
46. WICKHAM, H. F., 1908.—"New Fossil Elateridæ from Florissant." *Amer. J. Sci.* (4), xxvi, 76-78; July.